The Pharma Innovation Journal 2018; 7(7): 1031-1034

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(7): 1031-1034

www.thepharmajournal.com
Received: 14-05-2018
Accepted: 20-06-2018

Dr. Shehla Nazeer
Assistant Professor,
Department of Physiology,
SUMER, Jamia Hamdard,
New Delhi, India

Correspondence
Dr. Shehla Nazeer
Assistant Professor,
Department of Physiology,
SUMER, Jamia Hamdard,
New Delhi, India

Accuracy of various anthropometric parameters in predicting dyslipidaemia: A comparative assessment

Dr. Shehla Nazeer

Abstract
Aim: This study aims to determine the association of dyslipidemia of obesity with anthropometric indices.
Materials and Methods: This cross-sectional study was carried out in the Department of Physiology, India for the period of 1 year. Total 120 healthy males & females with the help of self structured questionnaire were included in this study. WC was measured, in cm, midway between the lower costal margin and iliac crest during the end expiratory phase, with a non elastic tape. Hip circumference was measured, in cm, at the level of the greater trochanters, with the person standing and relaxed muscles.
Results: Mean age of obese group and non obese group was 41.5 ± 9.28 years, 39.5 ± 9.37 years respectively. Mean body weight of obese group and non obese group was 94.78 ± 5.78 kg, and 92.66 ± 6.47 kg, respectively. Mean height of obese group and non obese group was 161.7± 4.78 cm, and 158.2 ± 5.15cm, respectively. Mean BMI of obese group and non obese group was 28.21 ± 2.5kg/m2, and 23.45 ± 2.7 kg/m2, respectively. Mean WHR of obese group and non obese group was 0.96 ± 0.10 cm, and 0.79 ± 0.07 cm, respectively. All the anthropometric variables were found highest in the obese group as compared to non obese group and this difference between the groups was statistically highly significant.
Conclusion: Obesity strongly correlates with dyslipidemia and altered lipid profile status. Furthermore, from this study, we can say that WHR is the most specific parameter that can be used in the clinical setup to identify within obese subjects those who are more predisposed for developing CVD and treated appropriately.

Keywords: obesity, body mass index, lipid profile, anthropometric indices

Introduction
Being obese or overweight is having an abnormally high level of fat in one's adipose tissue to the point that it interferes with one's ability to function normally [1]. Obesity at the population level is best assessed using the BMI (body mass index). Weight status and amount of adiposity may be meaningfully compared and the at-risk group can be identified by its categorization. Public health in our nation is in jeopardy because of the rapid pace of modernisation and the adoption of a low-physical activity lifestyle. According to the BMI, obesity is defined as kg/m^2 (kg/ft^2).
WHO defines overweight as BMI 25.00; pre-obesity: BMI 25.00–29.99; Class I obese: BMI 30.00–34.99; Class II obese: BMI 35.00–39.99; and Class III obese as BMI [2].
The Asian cut off value for overweight and obese is BMI ≥23.0 and ≥25.0, respectively [3]. Ethnic communities have varying body compositions and proportions, therefore 3 BMI does not discriminate between muscle and fat weight [4].
Adverse eating habits, lack of exercise and genetic susceptibility are all factors that contribute to obesity in certain populations. The intricate interplay of these factors results in obesity. More over 1.9 billion individuals (39 percent) and above were overweight or obese in 2016, according to the World Health Organization (WHO). Of them, over 650 million (13 percent) were considered obese [5]. A rise of 9.3–18.6 percent in the percentage of men and women who are overweight or obese (BMI 25.00 kg/m2) has occurred in India during the previous decade [6]. A higher chance of developing type 2 diabetes, hypertension, coronary heart disease, gallbladder disease, certain malignancies, and degenerative bone disorders is associated with obesity [7]. For a small BMI range, abdominal fat is very variable. Abdominal fat build-up may be seen if the waist–hip ratio is more than 1 in males and greater than 0.85 in women [8].
Recent studies show that waist size has a greater impact on cardiovascular and metabolic health than previously thought (WC) [9, 10]. Obesity is associated with an increased risk of developing atherosclerosis. Coronary heart disease is closely associated with the total cholesterol (TC) to high-density lipoprotein cholesterol (HDL-C) ratio (CHD) [11].

Atherosclerosis is more common in obese people because of their elevated cholesterol levels.

For this reason, Asian Indians are more likely than other ethnic groups to acquire insulin resistance syndrome and develop early onset atherosclerosis [12].

According to the National Cholesterol Education Program's Adult Treatment Panel III, values of TC more than 240 mg/dl are considered to be a risk factor for coronary artery disease (CAD). In addition, LDL-C more than 100 mg/dl and HDL-C less than 60 mg/dl are considered unhealthy levels of cholesterol [13].

However, these modalities aren't suitable for regular clinical usage because of their lower cost efficiency when compared to tried-and-true anthropometric procedures. Obesity as a potential predictor of dyslipidemia is likely to be beneficial in attempts to prevent, detect early, and reduce both mortality and morbidity by simple, noninvasive anthropometric measures. For improved illness prevention and early detection, it is critical to find the optimal anthropometric index in every given group. A dearth of data on the anthropometric profile of south Indians and its relationship to dyslipidemia is a problem. Aiming to avert future health problems, this research aims to examine the ability of simple, non-invasive procedures that may be used in field operations to forecast roughly predicting approximately the lipid levels in the body.

Material and Methods

This analytical observational study was carried out in the Department Of Physiology, India for the period of 1 year, after taking the approval of the protocol review committee and institutional ethics committee. After taking informed consent detailed history was taken from the Participant.

Methodology

The presence of history of dyslipidemia, hypertension, diabetes mellitus, malignancy or any other major chronic illness, use of lipid lowering agents, or other drug delivery system, family history of lipid related disorders as well as critically ill patients presenting with medical emergencies like myocardial infarction, hyperglycemia, ascites or pregnancy were excluded from the study. Total 120 cardio – metabolically healthy males & females with the help of self - structured questionnaire were included in this study. WC was measured, in cm, midway between the lower costal margin and iliac crest during the end expiratory phase, with a non-elastic tape.

Hip circumference was measured, in cm, at the level of the greater trochanters, with the person standing and relaxed muscles. WHR was defined as the WC divided by the hip circumference. Body weight and height were measured without shoes, using an electronic measuring scale. BMI was calculated as weight in kg divided by height in m2 (Quetlet's Index) [14]. 5 ml venous blood was collected from each subject after an overnight fast of 12-14 hours. Serum was separated within one hour of the blood collection and stored at -200C until analyzed for lipid profile. Serum samples were analyzed for lipid profile estimations by using Standard methods.

Statistical Analysis

All statistical tests were conducted using SPSS version 20. Significance value was taken as 'p' < 0.001 or 'p' < 0.05. Sensitivities and specificities of anthropometric indices were compared.

Results

Mean age of obese group and non obese group was 41.5 ± 9.28 years, 39.5 ± 9.37 years respectively. Mean body weight of obese group and non obese group was 94.78 ± 5.78 kg, and 92.66 ± 6.47 kg, respectively. Mean height of obese group and non obese group was 161.7± 4.78 cm, and 158.2 ± 5.15cm, respectively. Mean BMI of obese group and non obese group was 28.21 ± 2.5kg/m2, and 23.45 ± 2.7 kg/m^2, respectively. Mean WHR of obese group and non obese group was 0.96 ± 0.10 cm, and 0.79 ± 0.07 cm, respectively. All the anthropometric variables were found highest in the obese group as compared to non obese group and this difference between the groups was statistically highly significant table 1.In present study, based on WC 70% of study population were categorized in obese group and 30% as non obese group. On basis of WHR 60% of subjects were grouped as obese and 40% as non - obese. Further, 55% of subjects were grouped under obese category and 45% as non-obese based on BMI values. Anthropometric indices and serum lipid profile values showed a significant ($p< 0.001$) increase in obese group when compared to non-obese group (Table 1). Further, based on percent sensitivity and specificity of anthropometric parameters in predicting dyslipidaemia WC was more sensitive in terms of diagnostic accuracy, i.e. correctly identified the obese with dyslipidaemia, (67.5%) and WHR showed higher positive predictive value considering the diagnostic power, i.e. ability to correctly predict occurrence of dyslipidaemia (PPV % - 90%) in healthy study subjects (table 2).

Table 1: Anthropometric indices and serum lipid profile in obese and non - obese group; values expressed as Mean ±SD

Parameters	Obese group	Non – Obese
Age	41.5 ± 9.28	39.5 ± 9.37
Height	161.7± 4.78	158.2 ± 5.15
Waist circumference (cm)	93.89 ± 7.87	81.10 ± 8.01*
Waist Hip Ratio	0.96 ± 0.10	0.79 ± 0.07*
BMI (kg/ m2)	28.21 ± 2.5	23.45 ± 2.7*
Total Cholesterol	242.78±29.07	172.75 ± 24.25*
Triglycerides	252.88 ± 30.79	107.00 ± 29.49*
HDL	32.79 ± 5.87	45.11 ± 2.88*
LDL	135.12 ± 13.02	82.11 ± 10.07*

* - $p< 0.001$; obese versus non obese group

Table 2: Percent Sensitivity and specificity of anthropometric parameters in predicting dyslipidaemia

	WC (cm)	WHR	BMI (kg/ m 2)
Sensitivity	67.5	62.5	54
Specificity	42.5	47	39.5
Positive predictive value %	84.5	90	82.5
Negative predictive value %	14.5	15	13.5

Discussion

Dyslipidemia is an independent and modifiable risk factor for cardiovascular diseases.[15] Prevalence of dyslipidaemia in recent years might be probably due to westernization of diet and transitions in wealth and lifestyle. Obesity poses a significant health threat to individuals and places a major burden on health care system. Obesity is associated with endothelial dysfunction, greater arterial stiffness[16] and insulin tolerance. Early detection of obesity by simple and reliable methods can help reverse or reduce these untoward effects. Anthropometric measurements are surrogate measures of body fat and are better predictors of dyslipidemia. They require no sophisticated equipment, lengthy procedures and

are cost-effective. Literature survey shows that anthropometric index varies according to study design, geographic area and characteristics of the study population [17, 18].

WC, WHR and BMI are good indicators for body fatness and central fat distribution. In our study, anthropometric measures of obesity were significantly correlated with prevalence of dyslipidemia. The association of dyslipidemia with obesity observed in this study is in accordance with previous research reports [17, 18]. Further, WC more accurately predicted deranged lipid profile and WHR has rightly projected obese subjects with dyslipidaemia. Studies with computed tomography sections have disclosed the fact of nearer relationship between dyslipidemia and WC [18-20]. An increased WC is most likely associated with elevated risk factors because of its relation with visceral fat accumulation, mechanism may involve excess exposure of the liver to fatty acids [21]. Waist circumference (WC) has been recommended as a better indicator of abnormal fat content in the body than BMI. This has also been validated by the Quebec Health Survey done by Lemeui *et al.* [22]. The inability of BMI to correctly predict deranged lipid profile is in agreement with another broad based study done by Shamai *et al.* [23]. BMI does not take into account proportion of weight related to increased muscle mass, bone weight or visceral organ mass. Individuals with a similar BMI can vary considerably in their abdominal fat mass by virtue of these factors. And hence, with same BMI can have varied range of serum lipid profile. Our study observed that compared with BMI, WC and WHR are good indicators for body fatness in adults at the population level and as well provide additional information about central fat distribution. This is in agreement with the studies of Xu C *et al.* and the fieldwork done by Feldstein *et al.* in the Chinese and Argentine populations, respectively and thus validates that WC is a better predictor of dyslipidaemia than WHR, WHtR and BMI [24, 25]. Identifying early dyslipidaemia can help in instituting corrective measures to reduce disease burden. Raised values of WC and WHR might be useful as relatively inexpensive first stage screening tools to detect dyslipidaemia. Routine health examination will enhance obesity related evaluation of cardiovascular risk factors and thus, in prevention of future health hazards. Present study concluded that WC is a more sensitive and a reliable predictor while WHR is a more specific anthropometric index in predicting dyslipidaemia among healthy individuals. Incorporating these into routine health examination will enhance obesity related evaluation of cardio vascular risk factors and thus, in prevention of future untoward health hazards.

Conclusion

Obesity strongly correlates with dyslipidemia and altered lipid profile status. Furthermore, from this study, we can say that WHR is the most specific parameter that can be used in the clinical setup to identify within obese subjects those who are more predisposed for developing CVD and treated appropriately

Reference

1. Garrow JS. Obesity and Related Diseases. London: Churchill Livingstone, 1988, 1-16.
2. World Health Organisation. Physical Status: The Use and Interpretation of Anthropometry. Report of a WHO Expert Committee. (Technical Report Series No. 854). Geneva: World Health Organisation, 1995, 329.
3. World Health Organization, International Association for the Study of Obesity, International Obesity Task Force. The Asia Pacific Perspective: Redefining Obesity and its Treatment. Sydney: World Health Organization, 2000, 229.
4. Swinburn BA, Craig PL, Daniel R, Dent DP, Strauss BJ. Body composition differences between polynesians and caucasians assessed by bioelectrical impedance. Int J Obes Relat Metab Disord. 1996;20:889-94.
5. World Health Organization. Obesity and Overweight, Factsheet Updated; 2020. Geneva: World Health Organization. 2020. Available from: http://www.apps.who.int/mediacentre/factsheets/fs311/en/index.html. [Last accessed on 2018 Feb 03].
6. International Institute for Population Sciences. India Fact Sheet. National Family Health Survey-4. Mumbai: International Institute for Population Sciences (Deemed University), 2015-16.
7. World Health Organization. Fact Sheet N 311. Obesity and Overweight. 2015. Available from: http://www.who.int/ mediacentre/factsheets/fs311/en.
8. Han TS, Seidell JC, Currall JE, Morrison CE, Deurenberg P, Lean ME. The influences of height and age on waist circumference as an index of adiposity in adults. Int J Obes Relat Metab Disord. 1997;21:83-9.
9. Ross R, Shaw KD, Rissanen J, Martel Y, De Guise J, Avruch L. Sex differences in lean and adipose tissue distribution by magnetic resonance imaging: Anthropometric relationships. Am J Clin Nutr. 1994;59:1277-85.
10. Han TS, Richmond P, Avenell A, Lean ME. Waist circumference reduction and cardiovascular benefits during weight loss in women. Int J Obes Relat Metab Disord. 1997;21:127-34.
11. Enas EA, Kannan S. How to Beat the Heart Disease Epidemic among South Asians: A Prevention and Management Guide for Asian Indians and their Doctors. Chicago: Grace Printing, 2005.
12. Misra A, Vikram NK. Insulin resistance syndrome (metabolic syndrome) and obesity in Asian Indians: Evidence and implications. Nutrition. 2004;20:482-91.
13. US. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Heart Lung and Blood Institute, 2001. Available from: http://www.nhlbi.nih.gov/healthpro/guidelines/current/cholesterol-guidelines/ quick-deskreference-html.
14. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363:157-63.
15. Fred P, Virginie SF, Vincent W, Pascal B. Dyslipidemia and abdominal obesity: an assessment in three general populations. Journal of Clinical Epidemiology. 2000;53:393-400.
16. Wildman RP, Mackey RH, Bostom A, Thompson T, Sutton-Tyrrell K. Measures of obesity are associated with vascular stiffness in young and older adults. Hypertension. 2003;42:468-473.
17. Nguyen NT, Magno CP, Lane KT, *et al*. Association of hypertension, diabetes, dyslipidemia, and metabolic syndrome with obesity: findings from the National Health and Nutrition Examination Survey, 1999 to 2004. J Am Coll Surg. 2008;207:928-34.
18. Deurenberg-Yap M, Chew SK, Deurenberg P. Elevated

body fat percentage and cardiovascular risks at low body mass index levels among Singaporean Chinese, Malays and Indians. Obes Rev. 2002;3:209-15.
19. Pouliot MC, Despres JP, Lemieux S, Moorjani S, Bouchard C, Tremblay A *et al*. Waist circumference and abdominal sagittal diameter: best simple anthropometric indexes of abdominal visceral adipose tissue accumulation and related cardiovascular risk in men and women. Am J Cardiol. 1994;73:460-8.
20. Ashwell M, Cole TJ, Dixon AK. Ratio of waist circumference to height is strong predictor of intraabdominal fat. BMJ. 1996;313:559-60.
21. Seidell JC, Bouchard C. Visceral fat in relation to health: is it a major culprit or simply an innocent bystander? Int J Obes Relat Metab Disord. 1997;21:626-31.
22. Lemieux I, Alméras N, Mauriège P, Blanchet C, Dewailly E, Bergeron J, *et al*. Prevalence of 'hypertriglyceridemic waist' in men who participated in the Quebec Health Survey: Association with atherogenic and diabetogenic metabolic risk factors. Can J Cardiol. 2002;18(7):725-32.
23. Shamai L, Lurix E, Shen M, Novaro GM, Szomstein S, Rosenthal R. Association of body mass index and lipid profiles: evaluation of a broad spectrum of body mass index patients including the morbidly obese. Obes Surg. 2011;21(1):42-7.
24. Xu C, Yang X, Zu S, Han S, Zhang Z, Zhu G. Association between Serum Lipids, Blood Pressure, and Simple Anthropometric Measures in an Adult Chinese Population. Arch Med Res. 2008;39:610-617.
25. Feldstein CA, Akopian M, Olivieri AO, Kramer AP, Nasi M, Garrido DA. Comparison of body mass index and waist-to-hip ratio as indicators of hypertension risk in an urban Argentine population: A hospital-based study. Nutrition, Metabolism & Cardiovascular Diseases. 2005;15:310-315.